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by

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The Manifold Fruits of Digitalization – Determining the Literal Value Behind

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Abstract. As digitalization is rewriting the rules of competition, companies need to adapt to external changes or they will be left behind. Indeed, digitalization bears a lot of economic potential and is undoubted to have tremendous impacts on the economy. Many companies already launched digital initiatives. However, most of them lack an understanding of the value digitalization can create. They often neither know the organizational value created, nor define accountability measures or specify targets. Therefore, as a first step this paper aims to provide clarity by relating digital benefits listed in literature and highlighting the underlying value drivers. Our results help companies to identify digital business value, but also lower the hurdles that prevent them from scaling up their digital effort.
Keywords: Digitalization, benefit, value driver.

1 Introduction

Digitalization is on the rise and "is rewriting the rules of competition" [1]. Those companies who are not able or willing to adapt will be left behind [1–3]. Especially the ability to handle the new challenges that come with digitalization will make the difference in future. The main differences compared to common IT usage lie in the faster speed of change, in the higher level of interconnectedness, and in the willingness of individuals to use technological devices [2]. Those phenomena already have an enormous impact on private lives and the society and will also tremendously impact business practices and success models. Hence, digitalization is considered as the fourth wave of industrialization, which will dramatically change the business world [4].

Many consultancies provide extensive studies about success stories, trends, challenges, strategies and benefits of digitalization [5–8]. The economic potential of the Internet of Things, for instance, is considered to be up to $ 1.9 trillion by 2020 [9]. And yet, the Internet of things is only one of the topics considered as digitalization. Cloud computing, big data, social networks, and many other novelties unfold even more prosperous properties. Many companies set up digital initiatives in order to benefit from the supposed fruits of digitalization. A study among 500 company executives by KPMG showed that about 43% of companies already conducted changes in their business

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model and that about 60% already made adjustments towards digital in their product and service portfolios and their administrative processes [6]. However, companies mostly lack a deeper understanding of the value digitalization can create within their organization and therefore are mostly not able to determine the gain their digital initiatives actually shall deliver. According to a survey among 850 C-level executives by Gottlieb and Willmott [10], only 7% of the respondents consider their organization to understand the exact value from digitalization. Furthermore, over 60% admit that their companies do neither have accountability measures nor specified targets for digital initiatives [10]. This emphasizes the necessity for shading light to manifold supposed fruits of digitalization.

Therefore, the goal of our research endeavor is to identify the value of digitalization within an organization. Therefore, we need to clarify the main value drivers of digitalization that can be used as a starting point for developing measures for the value of digitalization. Thus, we state the following research question:

What are the benefits and which aspects can be considered as underlying value drivers of digitalization?

Therefore, we analyze benefits of digitalization that have been identified in existing literature and derive to the underlying value drivers. We contribute to existing literature by analyzing and structuring existing literature to provide the basis for a detailed analysis of measurement approaches for digital value drivers. Furthermore, practitioners can benefit from our approach as we provide an identification of main benefits and propose value drivers to determine the gain of digital initiatives.

The remainder of the paper is organized as follows. After motivating our research and introducing the research question, we explain our research methodology. In section 2, we provide a structured literature review and synthesize the results of the literature review in section 3. In section 4, we derive conclusions, reveal limitations and give an outlook on future research.

2 Literature Review

This paper sticks to the well-established method for research synthesis of Cooper and Hedges [11] and adopts the changes towards the seven-step process of Cooper [12]. Accordingly, we formulate the scope including research objective and problem in the introduction section. In this section we outline the procedure of searching literature and define which information about each study is relevant to the previously described research objective. The selection of relevant studies based on their contribution and fit to the research problem is also illustrated. To integrate, condense and combine the results, we analyze the articles and develop an incorporating framework in section 3. Subsequently, the results are summarized and conclusions are drawn in the discussion section with regard to generalization and possible points of contact for further research. Finally, with this paper the results of the research are presented to public.

To ensure transparency and objectivity regarding the research sample selection, we identified relevant literature based on a keyword search of different data bases. As digitalization is a quite young research field, which is extensively discussed in research and practice, we included scientific literature as well as practice studies in our search.

Procedure: To identify relevant practice studies that cope with the value of digitalization initiatives, we draw on google search engine and used 'digi*' AND 'value' and 'digi*' AND 'benefits' as keywords. We focused on articles in English and German language. Furthermore, we searched white papers and studies from large management consultancies (e.g., McKinsey & Company, Accenture) and conducted a forward and backward search within the identified practice studies.

Hence, we gained a vast amount of results from our google search. Thus, we searched for publications by management consultancies and other white papers. After identifying the most relevant articles by screening the titles, we analyzed the introduction of the available data set. Thus, we identified 29 articles and studies that deal with the benefits and value of digitalization for companies.

To identify relevant scientific literature, we conducted a structured literature analysis based on established scientific databases that are relevant in the IS field. With new technologies and innovations like cloud computing, big data and many others establishing, the rules of competition have changed. But what is new with the phenomenon of digitalization compared to the usage of IT or digital technology that has been going on for years already? In this context, Gimpel and Röglinger [2] state, that "the new aspect of digitalization is not the usage of information technology per se but the speed of change and the world´s level of connectedness". The miniaturization of increasingly powerful computing hardware leads to an omnipresence of technological devices. This is associated as Moore's law and is considered to be the root cause or underlying driver of the digitalization phenomenon [2]. Additionally, this interpenetrating dissemination of IT combined with innovations like the internet enable all entities of an ecosystem to connect, which boosts an increase in value. Simultaneously to these technological developments, customers are increasingly willing to use technological devices. All in all, digitalization can be described as a situation in which different influence factors interact and thus the usage of digital technology is able to tremendously impact business practices and business models across almost all industries or even the whole ecosystem.

Hence, we searched for articles that cope with digitalization and the value that can be gained for a company due to digitalization. Thus, the keywords 'digi*' AND 'benefits' as well as 'value' in the title and the abstract of the articles were used. Furthermore, we limited the search to articles that were published after 2010, since we want to put new use and omnipresence of digital devices to the center of contemplation. With the release of the first iPhone in 2007 and the first iPad in 2010, there was an enormous increase of smart devices per person [13]. In 2010, the ratio of more than one smart device per person (calculated on the basis of the world's population) was observed for the first time [13]. Hence, we chose 2010 as an adequate time limit for our analysis. Table 1 shows the combination of search terms in the selected databases.

Table 1. Selected Databases and Search Terms

Database	*Keywords*
AIS Electronic Library	'digi*' AND 'benefits', 'digi*' AND 'value', 'digitalization'
EbscoHost	'digi*' AND 'benefits', 'digi*' AND 'value'
IEEEXplore	'digi*' AND 'benefits', 'digi*' AND 'value'

As digitalization is an extremely broad research field, many articles can be identified that somehow deal with digitalization. Thus, the scientific literature review generated a result of more than 300 articles with duplicates removed. To identify the articles that are relevant for our research topic, we first analyzed the titles of the articles whether they fit the focus of our manuscript to identify the value of digitalization for companies. All articles that obviously cope with another topic were excluded. In a second step, we analyzed the abstracts of the remaining articles and focused on the articles that deal with the value of digitalization for companies. After analyzing all articles, we gained a result of 27 articles which address the identification of the value of digitalization for companies. To complete the literature review, we conducted a forward and backward search recommended by Webster and Watson [14]. The identified articles were analyzed as previously described and if appropriate added to the selected sample. Finally, 31 articles were identified as relevant for further consideration.

Analyses: Concerning management and practice studies, beside almost all big players in the consulting industry, independent research institutes, as well as public institutions address digitalization in various studies. Even though many articles do not focus on a specific industry, most industries (e.g., media, banking, insurance, and manufacturing) are mentioned in the articles.

The influence of digitalization and the implications for companies is one of the major concerns in practice studies [4, 8–10]. Even though they focus on different aspects like the expectations of companies [10], influencing factors of digitalization on business and working processes or the effects of digitalization on a special industry, like production industry, the insurance industry, or German mid-sized companies they all agree that digitalization already has changed and will change many aspects of a company [6, 15, 16].

This digital transformation comes with several chances and challenges [2, 17, 18]. Therefore, Capgemini set up a study concerning the management practices and benefits of the digital transformation [19]. To accomplish successful digital transformation, organizational requirements need to change and classic organizational structures will no longer be adequate [20]. Thus, transformation management can decide about success or failure of a company in the digital age [2, 18, 21]. Reactions and requirements to overcome the new challenge are also widely discussed. Furthermore, the success factors and benefits of digitalization for companies are examined [1, 7, 18, 19]. Accenture conduct a survey among the Top 500 German companies and identify strategies that make the difference for the successful digital players [22].

Scientific literature on digitalization also discusses various topics. Currently, the focus of companies changes from developing an IT strategy towards integrating a ‘digital business strategy’ [3]. Digital business strategy sheds light on the possibilities and effects of digitalization on the firm. In general, it provides special attention on making explicit that the new digital technologies go beyond increasing efficiency and productivity towards competitive advantage and strategic differentiation [3]. Value creation is not limited to single products or services anymore. It expands opportunities to new dimensions that have not been accessible before [23]. Companies in future will not be successful because they once adopted a digital business strategy or business model. They will succeed due to flexibility in adapting to new circumstances and

requirements [23]. As the modes of collaboration within and beyond ecosystems will change, companies need to adapt and increase flexibility [24, 25]. Most articles concerning digital business strategy develop theoretical models concerning the digital architecture, digital networks, platforms and processes [e.g. 23–27].

Besides digital business strategy, the combination of digital and physical components is discussed in literature. Yoo et al. [28] define the "carrying out of new combinations of digital and physical components to produce novel products" as digital innovation. According to Barrett et al. [29] "the economy [shifts] from a goods-based to a service-based economy" due to digitalization and digital innovation [30]. The integration of digital technologies in traditional products promises increased performance and experience [31]. Thus, the combination of digital and physical products is becoming a strategic topic for many companies as the gained flexibility creates novel market offerings and thus benefits [28, 30, 32]. To gain the value that comes with new market offerings, new ways of defining digital services are required as it differs from the traditional logic of services [33]. Furthermore, traditional innovation processes need to change due to the integration of digital technologies [31].

Besides discussing the influence of digital technologies on the strategy of a company, the integration of digital technologies in the operations of companies is a focus topic in literature. Matt et al. [34] claim that if the four transformational dimensions 'use of technologies', 'changes in value creation', 'structural changes', and 'financial aspects' are closely aligned, the potential benefits of digitalization can be realized. This "include[s] increases in sales or productivity, innovations in value creation, as well as novel forms of interaction with customers, among others" [34]. The integration of new technologies into operations can furthermore leverage higher organizational efficiency and thus increase savings in cost and time [35, 36].

Digitalization can furthermore help to improve the communication within and beyond the company [37–39]. By building innovation communities companies can enlarge their idea pools and thus gain tangible as well as intangible benefits [39]. Due to easy communication in corporate blogs or platform forums the performance of employees can increase due to knowledge spillovers [37, 38]. Nevertheless, technology needs to be aligned with the business goal to improve overall performance.

Besides literature that deals with digitalization in general, there are several studies that examine digitalization within specific industry sectors, like automotive industry, retail banking, media, and public sector [40–42]. Even though all articles discuss different aspects and industry specifics, they agree that new business models can create new value-added services [40]. Improved communication with the customer as well as smart data analysis can help to recognize customer needs [42] and thus improve customer experience and satisfaction [41]. Furthermore, due to virtualization of decision and operating processes and standardization, companies can achieve an increase of efficiency that leads to higher productivity and thus reduced costs [40, 41].

Although various topics have already been discussed, neither in scientific nor in practice literature we can find a structured overview or framework that can help companies to understand the benefits of digitalization. Thus, we will examine the benefits of digitalization and the underlying value drivers in more detail.

3 Deriving the Value of Digitalization

Despite many studies from business consultancies about implications and possible benefits of digitalization, this topic is still very vague for many companies. They often are not able to grasp this topic in terms of being able to set concrete organizational objectives. Therefore, this section condenses the benefits previously investigated from scientific and practice literature in order to derive the value drivers of digitalization.

To receive a more objective result, we aligned to a structured approach and discussed all results with other researchers. As a first step we carefully screened the 29 practice studies and the 31 scientific articles for benefits of digitalization. We gathered all mentioned aspects in a central database. After having identified a variety of benefits of digitalization, we clustered all benefits independently of each other to get a common understanding of the various terms and notions mentioned. Then we discussed the results within each other and with other researchers. This led us to a result of 38 kinds of benefits. We derived an appropriate wording for each kind of benefit. For example, customer centric, delight customers, customer behavior, customer loyalty, customer trust, citizen-centricity, customer satisfaction, client experience were subsumed to the benefit *customer experience*. Due to space restrictions, we only included the final wording.

Since the identified benefits of digitalization are diverse regarding granularity and sphere of impact, we categorize them to different levels of an information system. Since the different elements of an information system usually are organized in organizational layers [43–45], we refer to an established model by Buhl and Kaiser [45] for information and communication systems to allocate them to appropriate layers of organizational information systems. This model has been applied for categorization by other studies before [46, 47]. The model classifies an organization in four different intra-organizational layers and is based on the classification by Frank [48] and Winter and Fischer [49]: *Business Model*, *Business Processes*, *Application Systems & Services (Appl. Sys & Services)*, and *Infrastructure*. The layers are connected and increase in granularity from the lower to the upper ones. Furthermore, the model considers *Customers* as value driver of each organizational endeavor and supposes them as extra-organizational layer, which is however closely connected to the intra-organizational business model.

Infrastructure mainly contains hardware and networks of a company [49] and describes all kinds of technology that are used within a company. The benefits that can be observed on this layer are caused by technological advances due to digitalization. The *Appl. Sys & Services* layer includes all software, application, and data components [49]. As more and more services are offered online, companies need to deploy IT applications to accomplish their business processes. The benefits that can be achieved within this layer are on a technical operations level but can help the company to accomplish the overall goals. The *Business Processes* layer pictures the procedure of performing service delivery to achieve the desired business goals [49] and thus this level includes all benefits that result from improvements on an functional operations level due to digitalization. In contrary to the process layer, the *Business Model* depicts the organization from a strategic point of view [48, 49] and should be aligned with

customer needs. Thus it connects the intra- and extra-organizational level. All strategic benefits that can be observed in literature are assigned to this layer. The *Customer* layer depicts an extra-organizational layer that refers to all interactions between the company and the customer. Thus benefits that result from the interaction with customers can be assigned to this layer. Table 2 gives an overview of the identified benefits. An overview of all references and a detailed assignment of references to the benefits can be found an extra online repository [50].

Table 2. Categorization of Digitalization Benefits

Customer	
relevance among customer	product and service quality
innovative products and services	customer experience
customer interaction convenience	customer tailored solution
drive customer behavior	customer conversion
Business Model	
enlarge customer pool	advance to new business fields
profitability	increased sales
increase returns	risk mitigation
expand to digital channels	cost reduction
competitive advantage	enable innovations
enhanced promotion	efficiency
new competitive business models	
Business Processes	
incr. productivity	process flexibility
reduced product time-to market	speed of service proposition
operational excellence	process automation
smart workflow integration	process improvement
gain external network synergies	
Appl. Sys & Services	
improved information base	use of customer data
new delivery model	use of internal data
knowledge management	customer insights
real-time information	
Infrastructure	
smart technologies	

Based on this investigation, we recognized in which areas digitalization particularly is supposed to lead to benefits. However, it still was not clear, how these benefits may pay off and how this can be appropriately measured. Furthermore, the benefits of digitalization are partially interlinked and mutually dependent. To depict the first idea of relationships between the identified benefits, we used deductive logic to relate the manifold vague digital benefits and to conclude on measureable value drivers of digitalization. In doing so, we gradually assigned the different kinds of benefits not only to the different intra- and extra-organizational layers, but also to particular levels of

granularity. Therefore, we used logic trees on each organizational level which visualize the different levels of granularity. Benefits of similar granularity have been assigned to the same level and differing ones have been assigned to different levels. Furthermore, we incrementally connected benefits on a lower level of granularity (e.g., *speed of service proposition* or *real-time information*) to benefits on higher levels of granularity (e.g., *increased productivity* or *profitability*), since the ones on the lower level logically contribute to corresponding ones on the higher level. Consequently, we derived a model that depicts a top-down and bottom-up perspective on all identified extra- and intra-organizational benefits related to digitalization.

Since the benefit of digitalization is a very vague research topic with only few existing scientific research, the objective of this paper was to open the field of research by structuring and relating different benefits mentioned in literature in a first step, rather than to state one particular hypothesis that needs to be tested. By structuring the existing benefits with logic trees, we used a qualitative, deductive method to actually state several different hypothesis about the relationship of the single benefits. In doing so, we tried to minimize subjective judgment by conducting a discussion group of diverse scientists. We had a core team of three researchers who discussed their findings and suggestions in several rounds with up to 20 other researchers, including five professors and several PhD graduates. Nevertheless, continuation research is still necessary to proof the stated hypothesis. The resulting model for the benefits of digitalization including their linkages and corresponding areas is depicted in Figure 1.

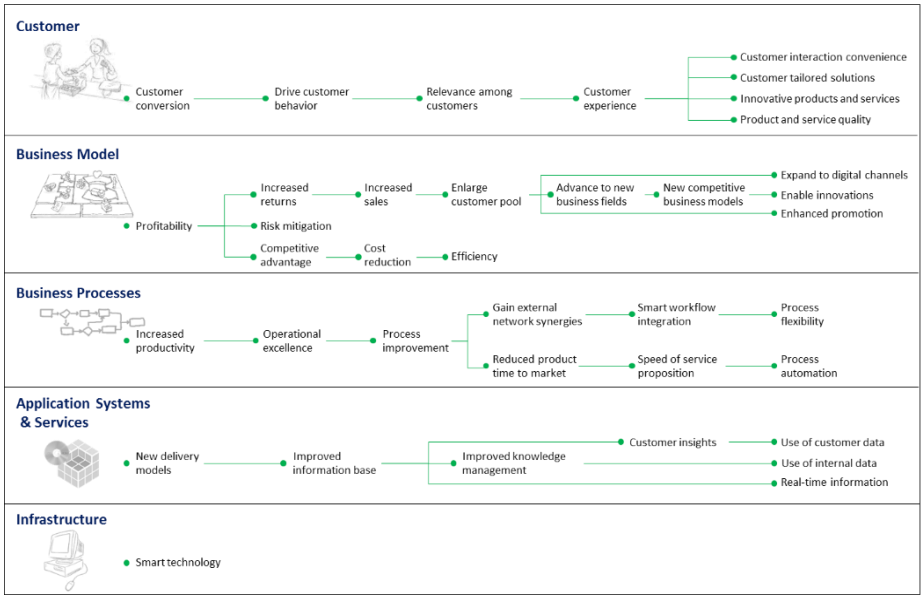

Figure 1. Logic Trees for the Digitalization Benefits on each Organizational Level

For all layers depicted in Figure 1, we exclusively used the benefits that were derived based on the analyzed literature and arranged them within logic trees. On the *Business Model* layer, Figure 1 shows the strategic benefits for an organization where, for instance, the *profitability* is influenced by three components: *increased returns*, *risk*

mitigation, and *competitive advantage*. First, we observe higher *profitability* due to *increased returns* that can be caused by *increased sales*. Increased sales depend on an *enlarged customer pool* which can be generated by an *expansion to digital channels*, the *advance to new business fields*, and *enhanced promotion*. The advance to new business fields is enabled by *new competitive business models* that are based on digital *innovations.* Second, the *profitability* of a company can be influenced by risk. If improved *risk mitigation* strategies can be applied due to digitalization, profitability of a company can be increased. Third, profitability is influenced by the *competitive advantage* a company can achieve due to *cost reductions*, which in turn can be gained by improved *efficiency*. According to this example, the logic trees on the other organizational layers can be read similarly. Furthermore, the logic trees are not only connected within but also beyond the organizational layers.

4 Discussion

To enable a valid assessment of the target state of digitalization within a company, an appropriate measurement is required in future research. Therefore, we need to identify value drivers that can be measured to assess the status of digitalization. On the strategic level (*Business Model),* the overall profitability of the organization could be measured. As the overall profitability of a company is influenced by internal and external factors, one would not be able to obtain whether an increase in profitability would stem from an improved customer interaction (external factor) or an operational improvement (internal factor). Thus, we will not directly draw on the profitability to derive the overall contribution. However, as the *Business Model* layer constitutes the linkage between the intra- and the extra-organizational layer, the interfaces between Business Model & Customer as well as Business Model & Business Processes might offer a starting point for an appropriate measure. By measuring the consequences of digitalization at the intra- and the extra-organizational interfaces of the *Business Model* layer, an overall perspective on the status of digitalization can be gained. Hence, for each interface an appropriate value driver should be identified that (1) is able to depict the overall influence of digitalization on the intra- and extra-organizational layers and (2) can be influenced by the company. Thus, we choose the benefits on the highest granularity level that can be influenced by the company, i.e., as close to the root node of the logic trees as possible.

Intra-organizational perspective: The benefit on the highest granularity level from the intra-organizational perspective is competitive advantage. The competitive advantage of a company cannot easily be measured. Thus, cost reduction should be analyzed for its applicability as a measure for the intra-organizational perspective. Many companies use cost reductions to measure the success of initiatives that are supposed to increase internal competitiveness [51]. Nevertheless, cost reduction does not necessarily need to be the consequence of internal improvement. For example, production costs will decrease if less products are produced. In turn, less revenues can be achieved with less products to be sold, which will lead to an overall negative result. Thus, the sole measurement of cost reduction cannot cover particulars on success of

digitalization. Thus, we examine *efficiency* as a value driver that can be measured. Efficiency is mainly driven by operational improvements of a company. In this paper, we consider efficiency from an economic perspective and hence suppose an activity to be efficient if there is no other way of performing a particular activity that leads to less cost, delivers the same results, upholds the same quality standards and is economically reasonable to invent. As efficiency, moreover, may be influenced by a company itself, we consider it to be an appropriate value driver for the intra-organizational perspective.

To assess efficiency within the organization established measures like maturity models or similar approaches can be used [52]. Thus, based on different maturity levels the status quo and target state of a company might be determined. A corresponding examination, however, is topic to further research.

Extra-organizational perspective: Within this perspective, there are many starting points for possible measures. For example, increased returns, increased sales, customer conversion and the size of the customer pool can quite easily be measured. However, those benefits are either not necessarily the consequence of external advancement or cannot be influenced directly by the company. Thus, we propose to choose *customer experience*, as this benefit is on the highest level of granularity that can be influenced by the company itself. While the other benefits like customer conversion oftentimes cannot be influenced from an internal point of view, customer experience can be directly changed with the help of appropriate projects.

A measure that might serve to determine a company's digital target state that maximizes the value driver customer experience is the Kano model [53]. This model measures customer experience through under and over fulfillment of customer expectations [54]. Based on a respectively designed questionnaire, a company could determine its customers' expectations, which might serve as a basis to determine the digital target state of the company. Another measure that could be used for assessing this perspective is the established American Customer Satisfaction Index [55]. A corresponding detailed examination is also in this case topic to further research.

Hence, *efficiency* and *customer experience* are identified as two of the main value drivers within digitalization that might be used as starting point to measure the value of digitalization and hence show the manifold fruits of digitalization. However, concrete measures as well as a reasonable process to assess the value of digitalization should be determined in future research.

5 Conclusion, Limitations and Outlook

As digitalization is on the rise, the competitive environment of companies in all different industries will change within the next years [1]. Thus, many companies set up digitalization initiatives to benefit from the promising prospects even though they lack a deeper understanding of the benefits digitalization can literally bring to their company. Furthermore, most companies are not able to assess their status quo as well as their target state concerning digitalization. To address the research question, we conducted a structured literature review within scientific and practice literature to identify the benefits of digitalization and to clarify the underlying value drivers. Thus,

we identified 38 kinds of benefits of digitalization which can be categorized into the five areas of the model for organizational information and communication systems *Customer*, *Business Model*, *Business Processes*, *Application Systems & Services, and Infrastructure*. We used logic trees to relate the manifold vague digital benefits within each layer and to conclude on measureable value drivers of digitalization.

To enable an overall measurement, it is reasonable to consider the internal and the external perspective. Hence, we identified value drivers that enable the measurement at the interfaces between the intra- and extra-organizational perspectives. From the intra-organizational perspective efficiency enables to measure the influence of internal improvements. Measuring customer experience, furthermore, enables to measure digitalization progress from an external view. Each digitalization project should thus target to contribute to the company's profitability in terms of efficiency or customer experience or even both values. Thus, if a company decides to invest in digital initiatives, they should be assessed based on those drivers.

Despite the merits of this paper in terms of clarifying benefits and value drivers of digitalization, it is not without limitations. We base our literature review on scientific and practice literature. While scientific literature sticks to objective research goals and methods, practice literature might inhabit a bias as management consultancies want to position themselves as digitalization experts. Thus, they might exaggerate the positive effects and downplay the risks and challenges to gain new assignments. Nevertheless, management consultancies were able to gain deep insights into the real world application of digitalization during the last years. As the main focus of our research endeavor is to identify the key benefits and value of digitalization, we consider practice studies to be the most fertile source of information. Furthermore, we manually clustered and categorized the identified benefits to different kinds of benefits and layers of the organization. This might lead to subjectivity. However, we tried to reduce subjectivity as far as possible by drawing on a structured research procedure and by discussing our results with other researchers. Moreover, the developed categorization of benefits and the identified value drivers are a first approach to clarify the value of digitalization. However, we did not yet derive an empirical investigation of the underlying hypothesis. This is topic to further research. Furthermore, future research should feel encouraged to analyze different measurement methods for digital value drivers as well as establish a process for the valuation of digitalization projects.

Overall, our study contributes to existing knowledge and approaches the research question raised within this manuscript. Our manuscript can be equally beneficial for research and practice. On the one hand, the approach contributes to future research by analyzing and structuring existing literature and can thus provide the basis for a detailed analysis of measurement approaches for digital value drivers. Furthermore, our results support practice with the identification of the main benefits and value drivers of digitalization. Thus, they can make use of the categorization to determine the gain of their digital initiatives. Thus, all in all, the approach can help practitioners to get a better understanding of the benefits of digitalization, which might lower the hurdles that prevent companies from scaling up their digital effort.

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